The Evolving Role of the Communication Service Provider

Integrated CNS Technologies Conference and Workshop
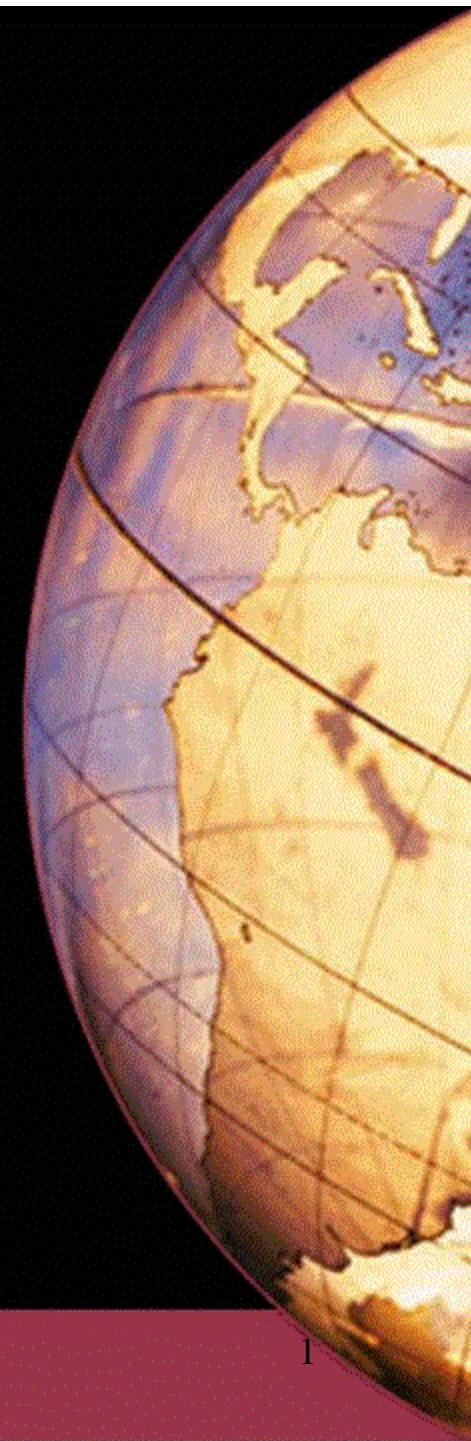
May 1, 2002

Al Homans

ARINC, Inc.

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

1

History of Air/Ground Communications

- **Early communications by HF voice**
- **1940s - VHF introduced**
- **1958 - FAA formed, implementation of national ATC system started, First B707 delivered to Pan Am.**
- **1978 - ARINC implements ACARS service**
  - 2 Customers (TWA and Piedmont)
- **1979 - 134 ACARS Ground Stations**
  - 4 customers, 415 aircraft
- **Today:** 95 Customers
  - Worldwide Service - 54 countries; 780 ground stations
  - Over 6,000 aircraft, 20 million messages per month
  - Performance availability = 99.995% at critical airports

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

2

- **Aircraft Communications Addressing and Reporting System (ACARS)**

  - An air/ground data link communications system

  - Enables aircraft to function as mobile data terminals in airline management control systems

  - Used to communicate airline operational control (AOC), air traffic control (ATC) and airline administrative control between ground-based organization and the cockpit

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

Voice vs. ACARS
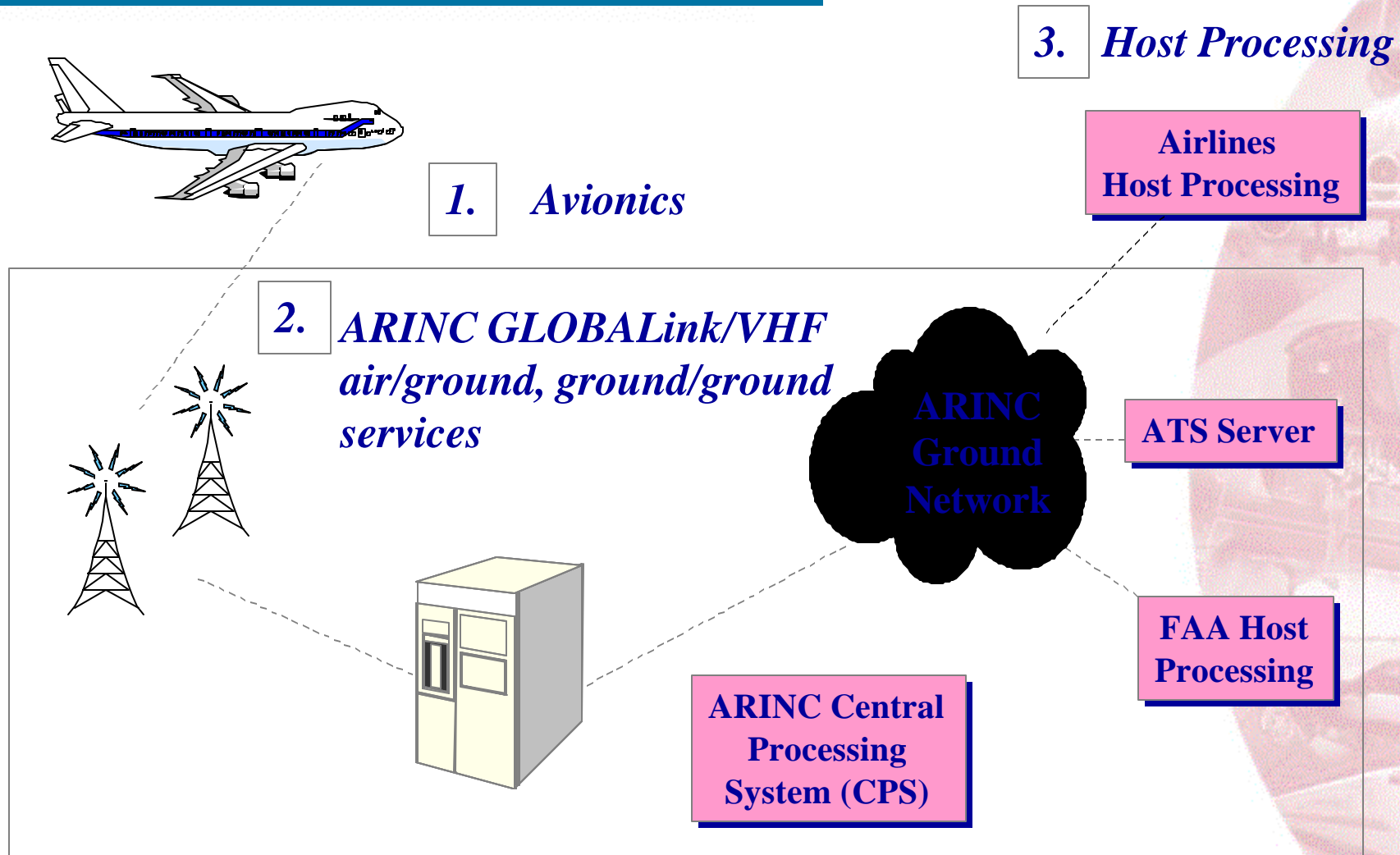# Message Volume Trends
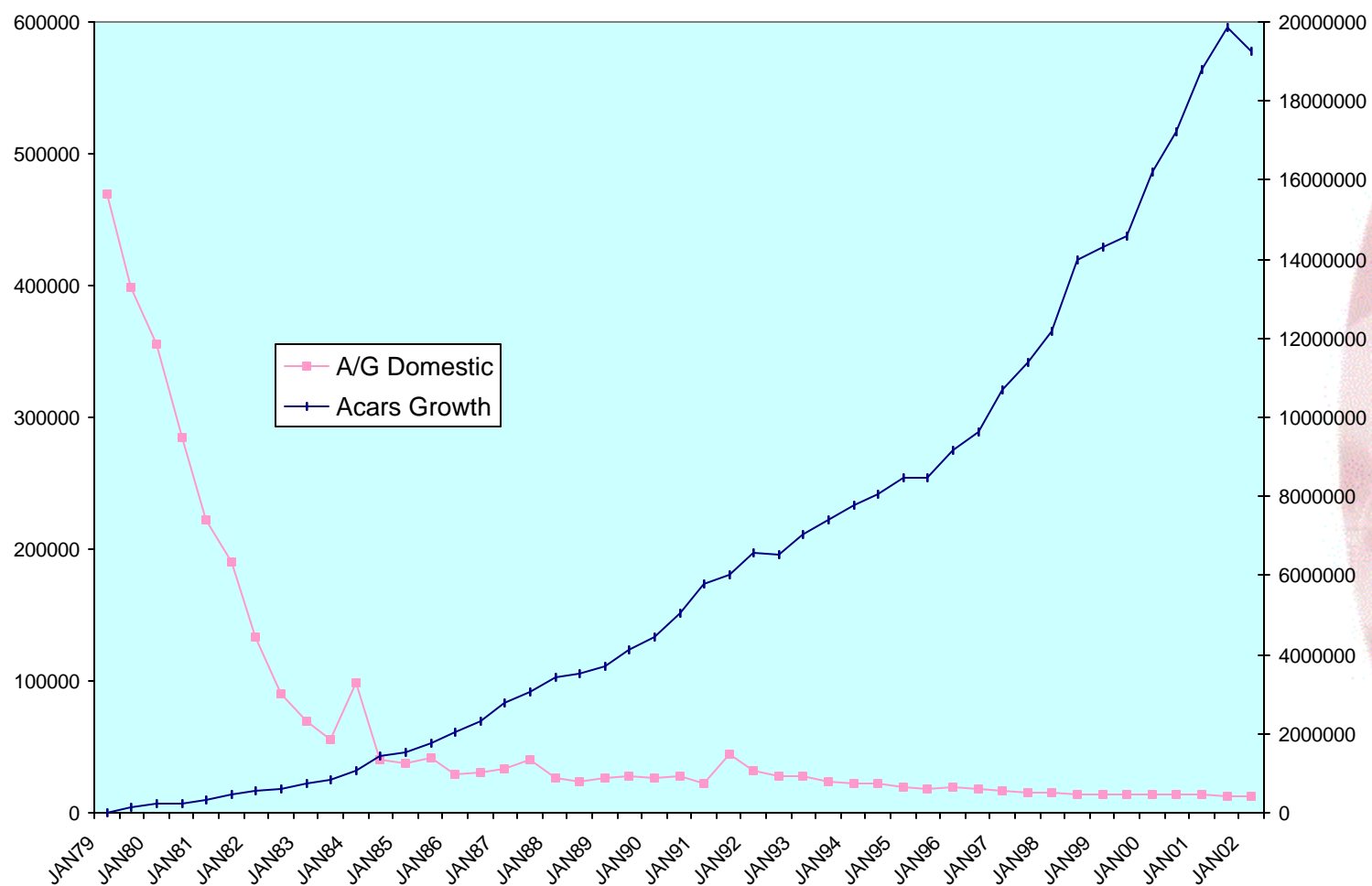
GLOBALink Media

- **VHF Data Link Communications**
  - Line-of-Sight; Over/Near Land
  - Least Expensive/Most Reliable

- **Satellite Data Link Communications (Satcom)**
  - Worldwide Except for Polar regions

- **HF Data Link Communications**
  - Over Oceans and Polar Regions

GLOBALink/VHF
Data Link Components

3. *Host Processing*

1. *Avionics*

2. *ARINC GLOBALink/VHF air/ground, ground/ground services*

Airlines Host Processing

ARINC Ground Network

ATS Server

FAA Host Processing

ARINC Central Processing System (CPS)

ARINC VHF - North America
Available for Use Coverage

Notes:
Altitude: 25,000 Feet MSL
Coverage Radius: 200
Nautical Miles.

Legend:
BOS   Name of Station

   Available For Use

Drawn By: tmcneil
File Name: noam_op.apr
Effective Date: January 24, 2002

ARINC
Annapolis, MD
www.arinc.com
globalink.infocise.com

1.15 miles = 1 nautical mile
400   0   400   Miles

N

GLOBALink VHF - South America
Planned Coverage

Notes:
Altitude: 25,000 Feet MSL
Coverage Radius: 200 Nautical Miles.

Legend:
POS Location Identifier
•   Available For Use
     Planned

Drawn By: tmcneil
File Name: soam_pl.apr
Effective Date: January 28, 2002

ARINC
Annapolis, MD
www.arinc.com
globalink.infocise.com

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

8

ARINC VHF - Europe
Available for Use Coverage

Notes:
Altitude: 25,000 Feet MSL
Coverage Radius: 200
Nautical Miles.

Legend:
DUB   Location Identifier
•   Available For Use

Drawn By: tmcneil
File Name: europe.apr
Effective Date: February 8, 2002

ARINC
Annapolis, MD
www.arinc.com
globalink.infocise.com

200   0   200   Miles
1.15 miles = 1 nautical mile

ARINC VHF - Asia/Pacific

Available for Use Coverage

Notes:
Altitude: 25,000 Feet MSL
Coverage Radius: 200 Nautical Miles.

Legend:
SEL — Location Identifier
• — Available For Use

Drawn By: tmcneil
File Name: asia.apr
Effective Date: January 28, 2002

ARINC
Annapolis, MD
www.arinc.com
globalink.infocise.com

400 0 400 Miles
1.15 miles = 1 nautical mile

N

Coordinates shown: 40°N, 60°E, 90°E, 120°E, 150°E, 180°, 10°N

Location identifiers shown on map:
GDX, SYA, TOG, AAT, MXV, HLD, HEK, JMU2, SHB, KUH, OBO, KHG, AKU, LRC, ULN, NDG, JMUA, WKJ, MMB, HKD, MSJ, HNA, GAI, SDJ, KCA, HMI, AVKZ, LNRZ, HLH, HRB, AKJ, CTS, DNH, IGN, TGO, CGQ, YNJ, TOY, KMQ, TTJ, YGJ, RKS, TYO, NRT, HND, LHWAZ, BAV, HETA, BEK, CIF, CHG, SHE, AOJ, AKT, SYO, IZO, INC, XNN, TYN, SJW, TSN, DLC, ICN, SEL, HIJ, KIJ, LHWA, XIY, TNA, TAO, KWJ, TAE, PUS, HAC, HZG, CGO, LYG, NGO, OSA1, KIX, TKS, TAK, CKI, KCZ, MYJ, CTU, ENH, WUH, HFE, NKG, SHA, CJU, OIT, KMI, FUK1, HSG, NGS, KMJ, KOJ1, LJG, CKG, DYG, KHN, TXN, HGH, NGB, ASJ1, LUM, DLU, KMG, KWE, CSX, WUIS, ROC, LEO, CKA1, JHG, NNGZ, KWL, KOW, WNZ, TSA, SHI, CNX, NNGA, CAN, SZX, SWA, TPE, OGN, ISG, UTH, MFM, HAK, KHH, BKK, LBP, SYX, UTP, HKT, LBM, MNL, NAW, CEB, DVO, MES, KUL, NTX, MYY, BKI, SPN, GUM, SIN, KCH, PLM, CGK

Data Link Applications

- **AOC - Airline Operational Control**
  - Flight dispatch
  - Maintenance
  - Crew scheduling
  - Station operations

- **ATS - Air Traffic Services**
  - Pre-departure Clearance (PDC)
  - Digital Automatic Terminal Information Service (D-ATIS)
  - Terminal Weather Information for Pilots (TWIP)
  - Oceanic Clearance Delivery (OCD)
  - Graphics/Text Weather Server (G/TWS)
 - Digital Delivery of Expected Taxi Clearance (DDTC)

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

AOC Applications

- **Flight dispatch**
  - Routes/flight plans
  - Weather data
  - Aircraft performance
  - Schedule information
  - Flight monitoring

- **Maintenance**
  - Engine condition data
  - Airframe condition data
  - Fault reporting
  - Maintenance releases
  - Maintenance log history

- **Crew scheduling**
  - Schedule verification
  - Re-assignments
  - Legality resolution

- **Station operations**
  - Gate assignments
  - Connecting passengers
  - Galley re-stock lists
  - ETA

ATS Applications

- **Pre-Departure Clearance (PDC)**

  - Delivery of pre-departure clearances over data link resulting in improved on-time gate departures and safety in the terminal area

- **Oceanic Clearance Delivery (OCD)**

  - Data link delivery of NavCanada clearance for the North Atlantic (NAT), expedites the complex oceanic clearance process

- **Digital Automatic Terminal Information Service (D-ATIS)**

  - Messages originated by the controller at tower workstation sent to aircraft quickly and accurately anytime during flight

- **Terminal Weather Information for Pilots (TWIP)**

  - Valuable weather condition information transmitted to aircraft via data link

- **Graphic/Text Weather Service (G/TWS)**

  - Terminal Area Forecasts (TAFS) and Meteorological Aviation Reports (METARs) for over 4,000 airport locations are stored in the ARINC server and delivered to the aircraft upon request

- **Digital Delivery of Expected Taxi Clearance (DDTC)**

  - Implemented at DTW and IAD

Today's Data Link Applications
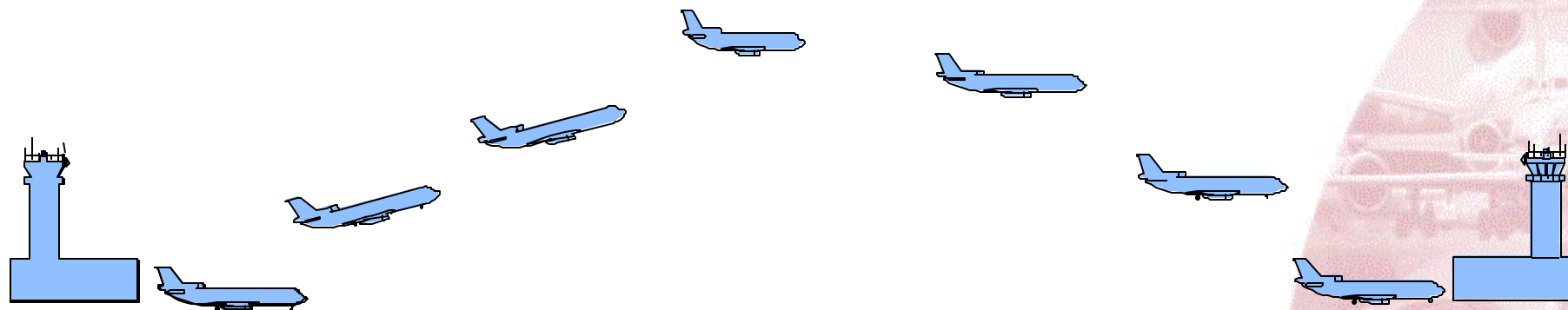
Taxi

From Aircraft
Link test/clock
Update
Fuel/crew information
Delay reports
Out

To Aircraft
PDC
ATIS
Weight & balance
Airport analysis
V-speeds flight
Plan-hard copy
Load FMC

Take-off

From Aircraft
Off

Departure

From Aircraft
Engine data

To Aircraft
Flight plan
Updated weather

En route

From Aircraft
Position reports
Weather reports
Delay info/ETA
Voice request
Engine info
Maintenance info

To Aircraft
ATC oceanic clearances
Weather reports
Re-clearances
Ground voice request
  (SELCAL)

Approach

From Aircraft
Provisioning
Gate requests
ETA
Special requests
Engine info
Maintenance info

To Aircraft
Gate assignments
Connecting gates
Passenger & crew
ATIS

Landing

From Aircraft
On

Taxi

From Aircraft
In
Fuel info
Crew info
Fault data
  (from central
  maintenance
  computer)

VDL Mode 2 / ATN
FAA CPDLC Build 1

- **CPDLC Build 1 operational evaluation will occur in the Miami ARTCC beginning this year**

- **CPDLC Build 1 partners: FAA Free Flight Office, American Airlines, Rockwell-Collins, and ARINC**

- **ARINC ATN/VDLM2 ground network includes:**
  - 4 stations in FL operational
  - Provides partial coverage of the Miami ARTCC airspace to support testing pre-operational testing
  - 5 additional stations (9 total) to be operational by Sep 02

- **FAA flight tests with Rockwell-Collins VDLM2 avionics and ARINC VDLM2 network started**
  - In the Miami ARTCC
  - Several successful preparation flights since late January 02

- **FAA Operations Begins in September 2002**

ARINC VHF - North America
VDL Planned and Available Coverage

GLOBALink℠/IFC Today
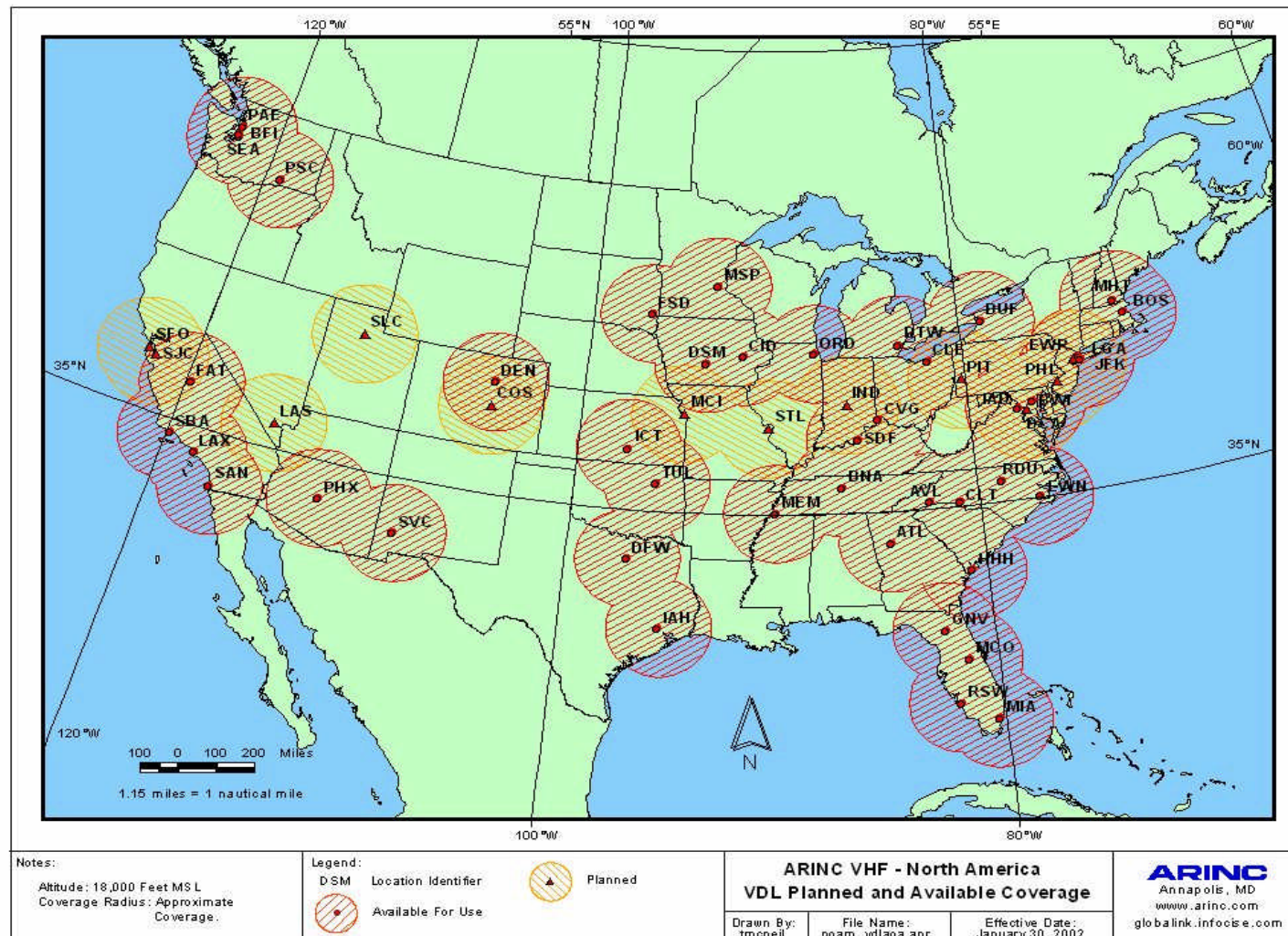
- Satellite Based Communications

  - Aero-H/H+, Aero-I, and Aero-L worldwide safety service available today

    - Multi-channel Cabin and Flight Deck data and voice applications

  - Aero-C and Aero Mini-M available today

    - Aero-C - Single channel 0.6 kbps store and forward data

    - Aero Mini-M - Single channel voice/2.4 kbps data

  - CN50 and High Speed Data (M4/IPDS) Swift64 availability mid-2002

    - CN50 - Aero-H/H+ compliant broadcast service

    - M4 - 64 kbps Circuit-mode cabin service

    - IPDS - 64 kbps Packet-mode cabin service

- Applications and Information Content

  - ACARS and FANS data link applications

  - Email and Internet services available through third party alliance

  - Live Text News and Short Messaging Service planned availability 4Q02

- Increased growth in air transport cabin and corporate jet markets

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

GLOBALink^{SM}/Satellite Safety Service Coverage
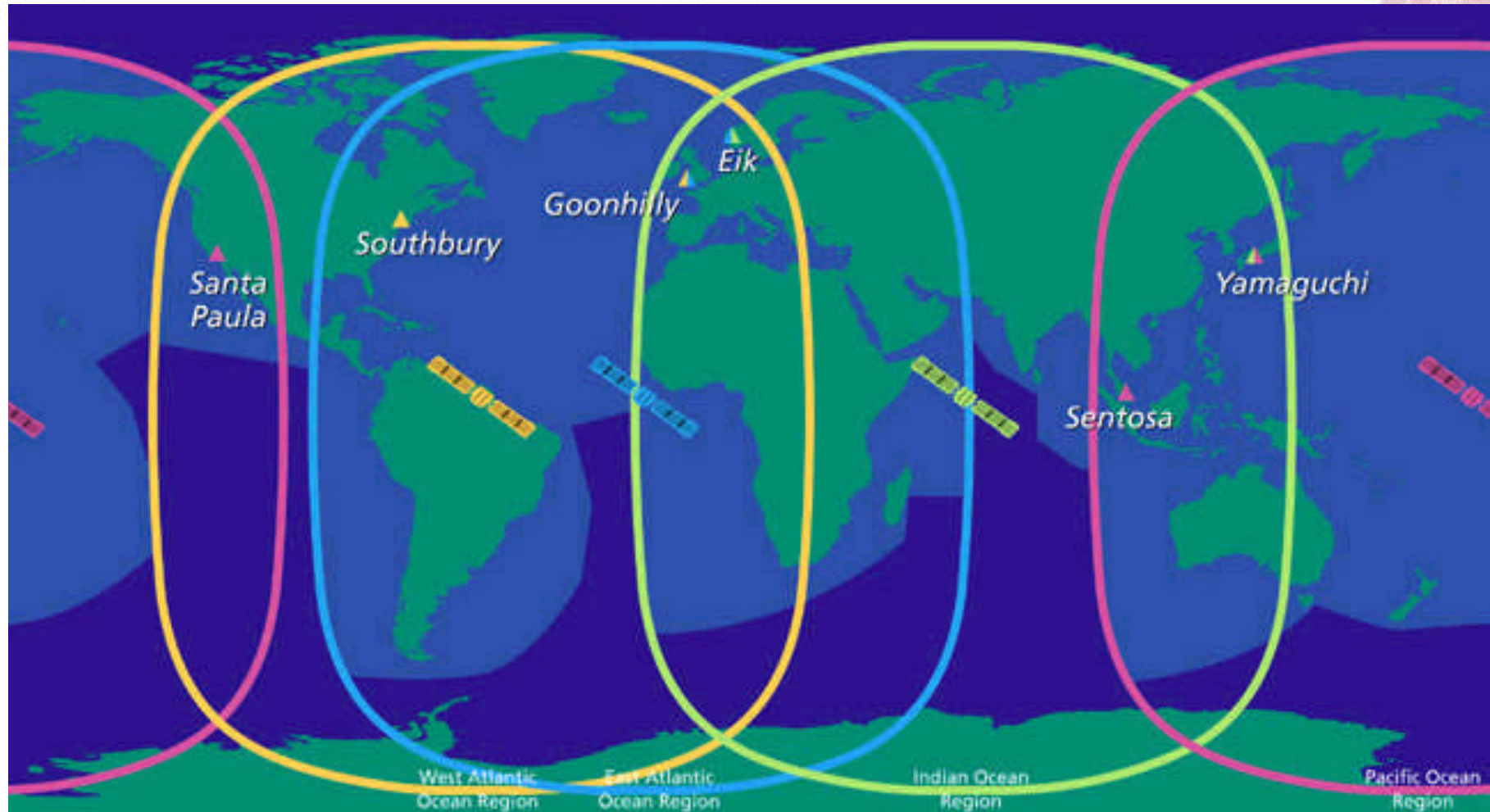
ARINC coordinates service through 6 of the 8 operating Aeronautical Ground Earth Stations
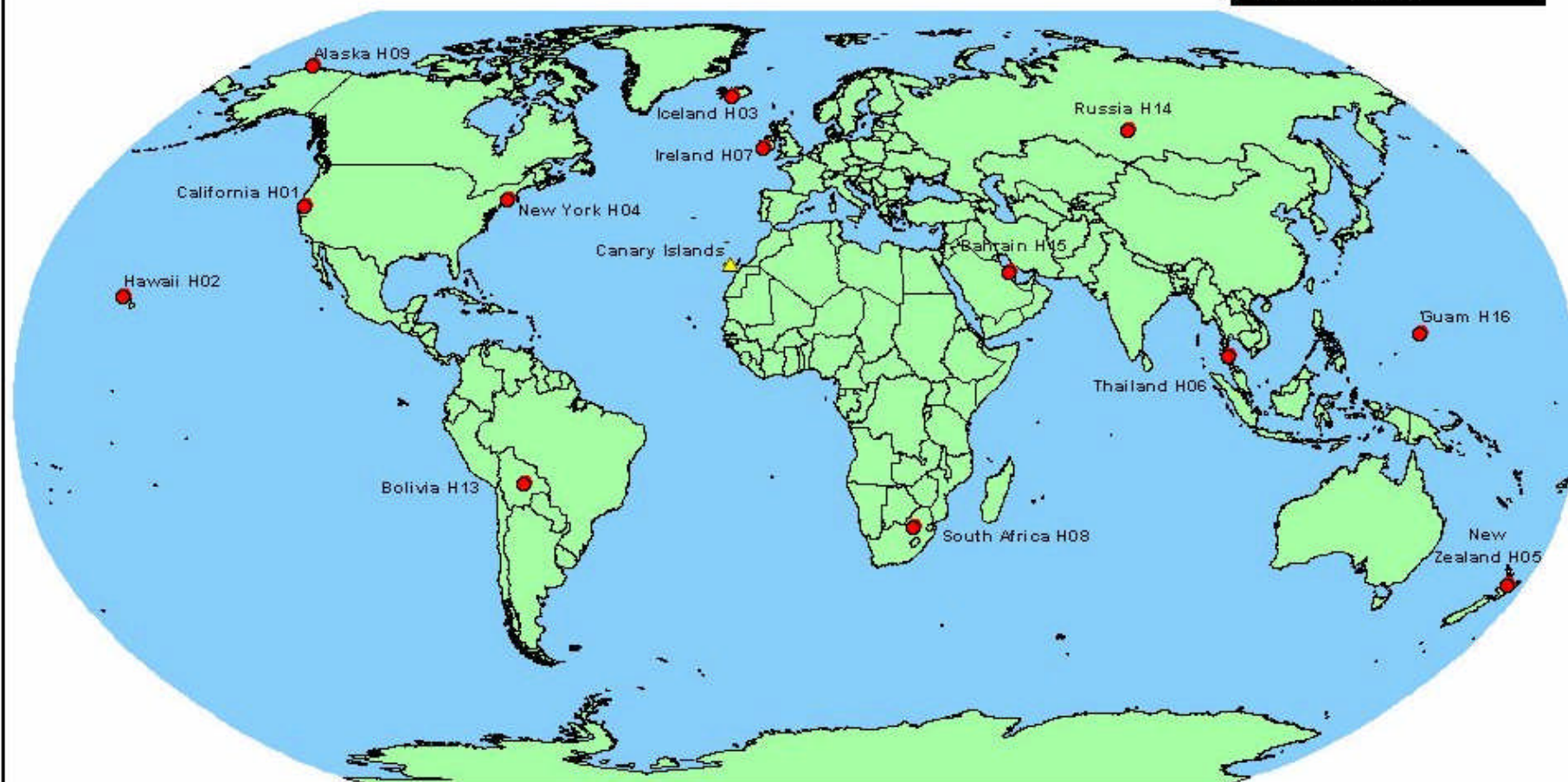
GLOBALink/HF?

- Part of ARINC's **GLOBALink** family of air/ground services
  - Interoperable with VHF, VDL and Satellite

- GLOBALink/HF or HF data link (HFDL) is an end-to-end communications system
  - HFDL is a beyond-line-of-sight (BLOS) communications capability

- Any air/ground ACARS message can be sent via HFDL

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™

Looking to the Future

- Greater dependence on Data Link for ATC
- Benefits of CPDLC
    - Reduced congestion on voice frequencies
    - Reduced controller workload
    - Increased throughput in congested areas
    - Potential savings to airlines of $500M/year through reductions in delays and flight times
- Increase in communications for passenger services
- Greater use of data link by GA; introduction of low cost data link avionics and services
- Implementation of NEXCOM - all digital voice and data

ARINC
YOU WON'T BELIEVE WHAT WE CAN DO.™